

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-15, 17-25 and 27-31 are pending in the application, with claims 1, 11, 12, 13, 14, 15, and 27 being the independent claims. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Examiner Interview

Applicant would like to thank the Examiner for the personal interview on January 17, 2006, which included: Examiner Daborah Chacko-Davis; and Applicant's representatives, Michael Messinger, Reg. No. 37,575 and Michelle Holoubek, Reg. No. 54,179. During the interview, Applicant's representatives pointed out differences between the following references and the claimed invention: U.S. Patent No. 6,404,482 to Shiraishi; U.S. Patent No. 5,541,026 to Matsumoto; and U.S. Patent Application Publication No. 2004/0245439 to Shaver. An agreement was not reached. Arguments made during the interview are incorporated and expanded herein.

Rejections under 35 U.S.C. § 103

Claims 1-4, 6-7, 9-15, 17-19, 21-25, and 27-31 stand rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over U.S. Pat. No. 5,541,026 to Matsumoto

("Matsumoto") in view of U.S. Pat. No. 6,404,482 to Shiraishi ("Shiraishi") and U.S. Pat. Publ. No. 2004/0245439 to Shaver ("Shaver"). Applicants respectfully traverse.

Regarding claims 1, 11, 12, and 13, the combination of Matsumoto, Shiraishi, and Shaver does not teach or suggest each element of these independent claims. These claims have been amended to recite, "calculating a polarization distribution based on a simulation of a pattern to be printed on the wafer," and "polarizing light according to the calculated polarization distribution." Since this polarization distribution is calculated for each mask pattern, the polarization distribution for a given mask pattern will vary according to the details of that mask pattern. Thus, each mask pattern may have a different polarization distribution. To calculate the polarization distribution for a particular mask pattern, computer simulations are run using the mask pattern. Once the polarization distribution has been calculated, it can be implemented using an appropriate standard polarizer, a custom polarizer or various combinations of polarizers.

None of Matsumoto, Shiraishi, or Shaver, taken alone or in combination, teach or suggest calculating a polarization distribution based on a simulation of a pattern to be printed on the wafer, and then polarizing light according to the calculated polarization distribution, as recited in amended claims 1, 11, 12, and 13.

Similar arguments may be made with respect to other independent claims 14, 15, and 27. For example, claim 14 recites shaping pre-polarized light according to "a polarization distribution calculated based upon a simulation of a pattern to be printed on a wafer." In another example, claim 15 recites, "a simulator that calculates a polarization distribution of an exposure beam for a particular mask pattern," and "a pattern polarizing device that converts the illumination light from the illumination source into the exposure

beam having the calculated polarization distribution." In yet another example, claim 27 recites, "calculating a polarization distribution of an exposure beam through simulation for a particular contact hole pattern," and "producing a polarized illumination beam wherein the illumination beam has the calculated polarization distribution."

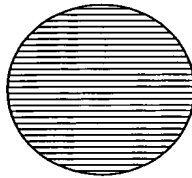
For at least these reasons, Applicants respectfully submit that claims 1, 11, 12, 13, 14, 15, and 27 are patentable over the combination of Matsumoto, Shiraishi, and Shaver.

Claims 2-4, 6-7, and 9-10 depend from claim 1, and are thus patentable for at least the reasons discussed with respect to claim 1. Claims 17-19 and 21-25 depend directly from claim 15, and are thus patentable for at least the reasons discussed with respect to claim 15. Claims 28-31 depend from claim 27, and are thus patentable for at least the reasons discussed with respect to claim 27.

Additionally regarding claims 2-4, 22-24, and 29-31, none of Matsumoto, Shiraishi, or Shaver teach or suggest producing a polarized exposure beam according to a radial, tangential, or custom polarization pattern, as recited in claims 2-4, 22-24, and 29-31.

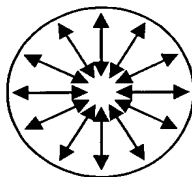
A custom polarization pattern is one that has a predetermined, non-uniform arrangement of polarization vectors, which is neither taught nor suggested by the combination of Matsumoto, Shiraishi, and Shaver. The Examiner states that Shiraishi discloses radial and tangential polarization. However, Shiraishi only discusses linear and circular polarization, and does not actually mention radial or tangential polarization at all. Matsumoto and Shaver also discuss only linear and circular polarization, not radial and tangential polarization.

Linear and circular polarization are quite different from radial and tangential polarization. Linear polarization is polarization that has the same vector direction across the whole of the beam. The sketch below illustrates graphically an example of such linear polarization in a cross-section of a beam:

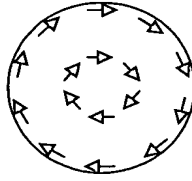


Circular polarization is similar to unpolarized light when viewed across a cross-section of the beam. With circular polarization, however, one component (e.g., the X component) of the beam lags the other component (e.g., the Y component) of the beam. This causes the polarization field to rotate over time. At any given time, the polarization distribution across the beam is random, but this random polarization rotates as the beam propagates over time.

With radial polarization, on the other hand, the direction of polarization vectors in the beam points out from the center of the beam or in towards the center, as illustrated in the example sketch of a beam cross-section below:



With tangential polarization, the direction of polarization across the beam changes with respect to the angle from the center of the beam, and forms a tangent to the circle centered at the center of the beam. The sketch below illustrates graphically an example of such tangential polarization in a cross-section of a beam:



As can be seen, linear and circular polarizations are quite different from radial and tangential polarizations, and the leap from linear/circular to radial/tangential is not trivial. Therefore, absent additional evidence to the contrary, it would not be obvious to one of skill in the relevant art(s) to use radial or tangential polarization in the present invention based on the discussions of linear and circular polarization in Matsumoto, Shiraishi, and Shaver.

For at least these reasons, Applicants respectfully submit that claims 2-4, 6-7, 9-10, 17-19, 21-25, and 28-31 are patentable over the combination of Matsumoto, Shiraishi, and Shaver. Reconsideration and withdrawal of the rejections of claims 1-4, 6-7, 9-15, 17-19, 21-25, and 27-31 are respectfully requested.

Claim 5 stands rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Matsumoto in view of Shiraishi and Shaver, and further in view of U.S. Pat. Appl. Pub. No. 2002/0176166 to Schuster ("Schuster"). Applicants respectfully traverse. Claim 5 depends from claim 1, and is thus patentable over Matsumoto in view of Shiraishi and Shaver for at least the reasons discussed with respect to claim 1. Schuster fails to overcome the above-noted deficiencies of Matsumoto in view of Shiraishi and Shaver. For at least these reasons, Applicants respectfully submit that claim 5 is patentable over the combination of Matsumoto, Shiraishi, Shaver, and Schuster. Reconsideration and withdrawal of the rejection of claim 5 is respectfully requested.

Claims 8 and 20 stand rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Matsumoto in view of Shiraishi and Shaver, and further in view of U.S. Pat. No. 5,539,514 to Shishido et al. ("Shishido"). Applicants respectfully traverse. Claim 8 depends from claim 1, and is thus patentable over Matsumoto, Shiraishi, and Shaver for at least the reasons discussed with respect to claim 1. Shishido fails to overcome the above-noted deficiencies of Matsumoto, Shiraishi, and Shaver. Therefore, the combination of Matsumoto, Shiraishi, Shaver, and Shishido neither teaches nor suggests every element of claim 8.

Similarly, claim 20 depends from claim 15, and is thus patentable over Matsumoto, Shiraishi, and Shaver for at least the reasons discussed with respect to claim 15. Shishido fails to overcome their deficiencies. Therefore, the combination of Matsumoto, Shiraishi, Shaver, and Shishido neither teaches nor suggests every element of claim 20.

For at least these reasons, Applicants respectfully submit that claims 8 and 20 are patentable over the combination of Matsumoto, Shiraishi, Shaver, and Shishido. Reconsideration and withdrawal of the rejections of claims 8 and 20 are respectfully requested.

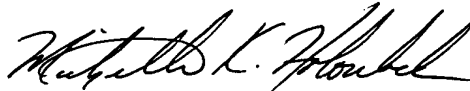
Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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